UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF SAFETY AND ENVIRONMENTAL ENFORCEMENT
GULF OF MEXICO REGION

ACCIDENT INVESTIGATION REPORT

For Public Release

1. OCCURRED
   DATE: **23-MAR-2015** TIME: **0505** HOURS

2. OPERATOR: **Cobalt International Energy, L.P.**
   REPRESENTATIVE:
   TELEPHONE:
   CONTRACTOR: **ROWAN COMPANIES INC.**
   REPRESENTATIVE:
   TELEPHONE:

3. OPERATOR/CONTRACTOR REPRESENTATIVE/SUPERVISOR ON SITE AT TIME OF INCIDENT:

4. LEASE: **G32460**
   AREA: **GB** LATITUDE:
   BLOCK: **958** LONGITUDE:

5. PLATFORM:
   RIG NAME: **ROWAN RELIANCE**

6. ACTIVITY:
- [X] EXPLORATION(POE)
- [ ] DEVELOPMENT/PRODUCTION (DOCD/POD)

7. TYPE:
- [ ] HISTORIC INJURY
  - [ ] REQUIRED EVACUATION
  - [ ] LTA (1-3 days)
  - [ ] LTA (>3 days
  - [ ] RW/JT (1-3 days)
  - [ ] RW/JT (>3 days)
  - [ ] Other Injury
- [ ] FATALITY
- [X] POLLUTION
- [ ] FIRE
- [ ] EXPLOSION
- LWC
  - [ ] HISTORIC BLOWOUT
  - [ ] UNDERGROUND
  - [ ] SURFACE
  - [ ] DEVERTER
  - [ ] SURFACE EQUIPMENT FAILURE OR PROCEDURES
- COLLISION [ ] HISTORIC [ ] >$25K [ ] <=$25K
- [ ] STRUCTURAL DAMAGE
- [ ] CRANE
- [ ] OTHER LIFTING DEVICE
- [ ] DAMAGED/DISABLED SAFETY SYS.
- [ ] INCIDENT >$25K
- [ ] H2S/15MIN./20PPM
- [ ] REQUIRED MUSTER
- [ ] SHUTDOWN FROM GAS RELEASE
- [ ] OTHER

6. OPERATION:
- [ ] PRODUCTION
- [X] DRILLING
- [ ] WORKOVER
- [ ] COMPLETION
- [ ] HELICOPTER
- [ ] MOTOR VESSEL
- [ ] PIPELINE SEGMENT NO.
- [ ] OTHER

8. CAUSE:
- [ ] EQUIPMENT FAILURE
- [X] HUMAN ERROR
- [ ] EXTERNAL DAMAGE
- [ ] SLIP/TRIP/FALL
- [ ] WEATHER RELATED
- [ ] LEAK
- [ ] UPSET H2O TREATING
- [X] OVERBOARD DRILLING FLUID
- [ ] OTHER _____

9. WATER DEPTH: **4846** FT.

10. DISTANCE FROM SHORE: **176** MI.

11. WIND DIRECTION: **NNW**
    SPEED: **16** M.P.H.

12. CURRENT DIRECTION: **SSE**
    SPEED: **1** M.P.H.

13. SEA STATE: **2** FT.

Background:
On 23 March 2015, the Rowan Reliance (Reliance) drill ship under contract to Cobalt International Energy, L.P. (Cobalt) reported a discharge of approximately 2200 barrels (bbl) of 15.3 pounds per gallon (ppg) synthetic oil base mud (SOBM) during well operations on Well 002 (North Platte #2) at the surface location in Garden Banks (GB) Block 958 (bottom hole location in GB Block 959). Cobalt notified the National Response Center (NRC Report #1111516) and reported to Bureau of Safety and Environmental Enforcement (BSEE) the estimated 2200 bbl of SOBM into offshore waters.

Chronological Order of Events:
On 15 and 16 February 2015, Rowan ran the blowout preventer (BOP) #2 and riser on the North Platte #2 well at the subsurface location of GB-959 using Rowan procedure RMS-WCG-013.

From 25 through 27 February 2015, Rowan conducted first on-bottom pressure and function testing of BOP#2 and ancillary BOP equipment while attached to the North Platte #2 well.

On 8 March 2015, the remote operated vehicle (ROV) discovered an accumulation of SOBM-like material on the first riser joint (Joint #64) and the flex joint termination spool but was dismissed as drill cuttings that was being discharged overboard. Numerous ROV dives after 8 March 2015 continued to observe the accumulation of SOBM-like material on the first riser joint and termination spool; however, according to information reported to BSEE during monthly rig inspections, Cobalt continued to assume that the SOBM-like material was drill cuttings.

On 20 March 2015, a gas and water kick was encountered at the measured depth of 20,631 feet (ft) and it was circulated out with 15.3 ppg SOBM. Late on 22 March 2015, a loss of SOBM was observed on the active system; therefore, the ROV was deployed to investigate. At approximately 0020 hour (hr) on 23 March 2015, the ROV observed SOBM discharging from the flange connecting the flex joint termination spool and the first riser joint (Joint #64). The upper annular was closed and drilling activities were suspended.

On 23 March 2015, Rowan notified the NRC and BSEE of the estimated 2200 bbl SOBM spill that consisted of Rheo-Logic synthetic base drilling fluid comprised of 48 percent (%) synthetic base oil, 32% solids and 20% water. Of the estimated volume of 2200 bbl SOBM lost, 1557 bbl were lost to the open water and the remaining 643 bbl

were lost in the open hole.

On 5 April 2015 at 1010 hr, BSEE arrived at the Reliance drill ship to conduct an investigation into the cause of the SOBM spill. BSEE conducted photographic documentation and gathered relevant photographs for the investigation.
Rowan reported to BSEE that BOP#2 was unlatched at 0330 hr and preparations were underway to pull it to the surface. Cobalt informed BSEE that Northwest Technical Solutions (NWTS) was hired to conduct an incident investigation on its behalf that concentrated on the identifying the probable causes. At approximately 1740 hr, Rowan began laying down riser joints and recording torque values as the riser bolts were removed using a Torq-Lite RT-40 hydraulic wrench. On 6 April 2015, Rowan continued pulling the BOP#2 to the surface and recording the torque values as the bolts were removed from the riser joints.

On 7 April 2015 at 0338 hr, the first riser joint (Joint #64) and flex joint termination spool broke the surface in the Reliance's moon pool area. At 0728 hr on 7 April 2015, the connection flange between the flex joint termination spool and the first riser joint (Joint #64) was separated and it was discovered that no Seal Sub (Mud Pin) was installed.

On 20 April 2015, NWTS submitted their final report to Cobalt on the investigation of the Rowan Reliance Riser Column Mud Loss. The NWTS investigation

concluded that the ultimate root cause of the SOBM spill incident was due to the lack of the installation of a Seal Sub (Mud Pin) in between the flex joint termination spool and first riser joint (Joint #64). In addition, the report stated that the low torque values recorded when breaking the riser bolts may have contributed to the incident.

On 18 August 2015, BSEE received Rowan's final investigation report entitled "Rowan Reliance Incident Investigation: Major Spill of Synthetic Oil Based Mud (SOBM) from the Marine Riser - Report of Findings". In addition, BSEE received the Cameron Marine Drilling Riser Inspection Report, the Cameron Visual Inspection Report of Riser Box End and Termination Spool Pin End and the Cameron cost quotes for repairing the riser joint and termination spool damaged by the SOBM spill.

BSEE's incident investigation along with the review of Cobalt and Rowan independent incident reports revealed the primary cause of the incident was attributed to the failure to install the Seal Sub (Mud Pin) in the flange connection between the flex joint termination spool and the first riser joint (Joint #64). BSEE visually verified the absence of the Seal Sub (Mud Pin) during an on-site investigation on 7 April 2015, when the BOP was retrieved to the surface.

In addition, Rowan informed BSEE that when BOP#2 and the riser joints were made up for deployment, the Torq-Lite RT-40 wrench was set at 1250 pounds per square inch (psi) which is equivalent to 13,000 foot-pounds (ft-lb). However, according to the Torq-Lite current operations manual, the torque wrench should have been set to 1600 psi (18,000 ft-lb) as required in the Cameron LoadKing 3.5 Flange Riser and Riser Connection Operations & Maintenance Manual.

Based on the Cobalt and Rowan independent incident report findings, the possible contributing causes for the SOBM spill were listed as follows: 1) inadequate Rowan procedures and checklist for deployment of the BOP and riser; 2) Rowan subsea personnel did not recognize or had any previous experience that required the Seal Sub (Mud Pin) to be installed in the "pin-up" configuration in the flex joint termination spool on the Cameron LoadKing riser system; 3) insufficient handover during a crew change of Rowan Subsea personnel during a critical phase of the BOP and riser deployment; 4) Cobalt's failure to recognize what was causing the buildup of SOBM and/or drilling cuttings in the area of the first riser joint and flex joint termination spool throughout the ROV coverage; 5) the culture of top down command structure may have led to misinterpretation of what material was being spilled and it prevented rig personnel for suggesting alternative explanations; and 6) the low torque valves recorded when breaking riser Joint #64 bolts revealed that the bolts were under-torqued when it was made up to the flex joint termination spool during BOP#2 deployment that provided a migration pathway of the SOBM into offshore waters.

18. LIST THE PROBABLE CAUSE(S) OF ACCIDENT:

BSEE's incident investigation along with the review of Cobalt and Rowan independent incident reports revealed the primary cause of the incident was attributed to the failure to install the Seal Sub (Mud Pin) in the flange connection between the flex joint termination spool and the first riser joint (Joint #64). BSEE visually verified the absence of the Seal Sub (Mud Pin) during an on-site investigation on 7 April 2015, when the BOP was retrieved to the surface.

19. LIST THE CONTRIBUTING CAUSE(S) OF ACCIDENT:

Based on the Cobalt and Rowan independent incident report findings, the possible contributing causes for the SOBM spill were listed as follows: 1) inadequate Rowan procedures and checklist for deployment of the BOP and riser; 2) Rowan subsea personnel did not recognize or had any previous experience that required the Seal Sub (Mud Pin) to be installed in the "pin-up" configuration in the flex joint termination spool on the Cameron LoadKing riser system; 3) insufficient handover during a crew change of Rowan Subsea personnel during a critical phase of the BOP and riser deployment; 4) Cobalt's failure to recognize what was causing the buildup of SOBM and/or drilling cuttings in the area of the first riser joint and flex joint termination spool throughout the ROV coverage; 5) the culture of top down command structure may have led to misinterpretation of what material was being spilled and it prevented rig personnel for suggesting alternative explanations; and 6) the low torque valves recorded when breaking riser Joint #64 bolts revealed that the bolts were under-torqued when it was made up to the flex joint termination spool during BOP#2 deployment that provided a migration pathway of the SOBM into offshore waters.

21. PROPERTY DAMAGED:	NATURE OF DAMAGE:
The box end of Riser Joint #64 and the pin end of the Flex Joint Termination Spool were damaged due to this incident.	**Riser Joint #64 box end the choke and kill lines had metal erosional washout areas. The Flex Joint Termination Spool connection flange was damaged beyond repair.**

ESTIMATED AMOUNT (TOTAL): **$151,353**

22. RECOMMENDATIONS TO PREVENT RECURRANCE NARRATIVE:

The BSEE Lafayette District recommends to the Office of Safety Management (OSM) Regional Office that a Safety and Environmental Management Systems (SEMS) audit be conducted concurrently during a Cobalt internal audit scheduled for the Rowan Reliance drill ship in November 2015.

23. POSSIBLE OCS VIOLATIONS RELATED TO ACCIDENT: **YES**

24. SPECIFY VIOLATIONS DIRECTLY OR INDIRECTLY CONTRIBUTING. NARRATIVE:

Based on the incident investigation findings; an E-100 Incident of Noncompliance (INC) and G-110 INC were issued "After the Fact" to document that Cobalt International Energy, L.P. (Cobalt) failed to provide adequate supervision during well operations on Well #002 (North Platte #2) located at the surface location in Garden Banks Block 958.

The E-100 INC was issued to Cobalt for the failure to protect health, safety, property, and the environment by allowing an unauthorized discharge of pollutants into offshore waters. On 23 March 2015, the Rowan Reliance drillship under contract to Cobalt had an unauthorized discharge of approximately 2200 barrels (bbl) of 15.3 pounds per gallon (ppg) synthetic oil base mud (SOBM) into offshore waters during well operations on Well #002 (North Platte #2). The SOBM spill was attributed to the failure to install a Sub Seal (Mud Pin) in between the first riser joint and flex joint termination spool that allowed a migration pathway for the SOBM to enter into the offshore waters. In addition, Cobalt failed to recognize throughout the ROV coverage what was causing the buildup of SOBM in the area of the first riser joint and flex joint termination spool.

The G-110 INC was issued to Cobalt for the failure to use and maintain equipment and materials necessary to ensure the safety and protection of personnel, equipment, natural resources, and the environment. On 23 March 2015, Cobalt reported a discharge of 2200 bbl of 15.3 ppg SOBM into offshore waters. During an on-site BSEE investigation on 7 April 2015, it was discovered that the root cause of the SOBM discharge was attributed to the absence of the Seal Sub (Mud Pin) that should have been installed in the flange connecting the first riser joint and the flex joint termination spool.

25. DATE OF ONSITE INVESTIGATION:

07-APR-2015

26. ONSITE TEAM MEMBERS:

Troy M. Naquin, AI Specialist /

29. ACCIDENT INVESTIGATION PANEL FORMED: **NO**

OCS REPORT:

30. DISTRICT SUPERVISOR:

Elliott S. Smith

APPROVED DATE: **17-SEP-2015**